Forensic Analysis of a Sony PlayStation 4 - A First Look

By

Allen Davies, Huw Read, Konstantinos Xynos and Iain Sutherland

Presented At
The Digital Forensic Research Conference

DFRWS 2015 EU Dublin, Ireland (Mar 23rd- 26th)

DFRWS is dedicated to the sharing of knowledge and ideas about digital forensics research. Ever since it organized the first open workshop devoted to digital forensics in 2001, DFRWS continues to bring academics and practitioners together in an informal environment. As a non-profit, volunteer organization, DFRWS sponsors technical working groups, annual conferences and challenges to help drive the direction of research and development.

http://dfrws.org
Forensic analysis of a Sony PlayStation 4: A first look
$ whoami

Presenter:
Matt Davies - Digital Forensic Analyst
Sytech Digital Forensics
Email: matt.davies@sytech-consultants.com
Company website: sytech-consultants.com
Tel: (01782) 286 300
Fax:(01782) 280 306

Dr. Huw Read - Senior Lecturer
University of South Wales
Email: huw.read@southwales.ac.uk
Tel:(01443) 654 287
Are games consoles are just toys?

• Former Walt Disney World employee arrested on Xbox child porn charges
• Milford cops say threat made through Xbox
• Couple left sickened over child porn sent to Xbox
• PlayStation sex crime: criminal used video game to get girl’s naked pictures
• Police: Xbox used to lure girls
• Mississippi deputy fired over threatening Xbox live players
• Prisoners using PlayStation 3s to commit crimes
Raison d'être

• Games Consoles each have their own unique architecture and operating systems.

• In addition, manufacturers such as Sony and Microsoft utilise encryption standards.

• How do we conduct an analysis of an encrypted PlayStation 4 in a forensically sound manner, without circumventing security measures?
Objectives of Research

1. Are methodologies used in 7th generation consoles relevant to 8th generation systems?
2. What forensically sound acquisition methods are available?
3. What avenues of interest exist on the PlayStation 4?
4. What artefacts can be obtained from online/offline analysis?
Previous Work

• Vaughan (2004) – Microsoft Xbox
• Burke & Craiger (2007) - Microsoft Xbox
• Turnbull (2008) – Nintendo Wii
• Xynos et al (2010) – Microsoft Xbox 360
• Conrad et al (2010) – Sony PlayStation 3
• Ridgewell (2011) – Networked Game Devices
• Moore et al (2013) – Xbox One
Features of Interest

- PlayStation Network (PSN)
- Sony Entertainment Network (SEN)
- Internet Browser
- ShareFactory
- System Storage Management
- Error History
- What’s New
- Trophies
- Profile
- Friends
- Party Messages
- Messages
Empirical Analysis

The experiment was carried out on firmware 1.01, 1.50, 1.51, 1.52, 1.60, 1.61, 1.62, 1.70, 1.72, 1.75 and 1.76 as follows.

- Activate video capture device, record time.
- Activate PlayStation 4. Record time as set on console.
- Introduce sample dataset, record time and data introduced.
- Turn off PlayStation 4. Deactivate video capture device, record time.
- Forensically image PlayStation 4 hard drive.
- Turn on PlayStation 4; investigate to identify user actions introduced during this experiment iteration.
- Compare the data retrieved in relation to the data introduced.
Test Data

The following sample data was used for each firmware iteration:

- Three offline (local) accounts: User1, User2, User3
- Two online accounts: PlayStation Network (PSN) account & PlayStation Plus
- “Friends List” contacts added to assess communication options
- Facebook account created to enable “ShareFactory” functionality
- Error History, Internet Browse URLs (Bookmarks, websites)
Initial Findings

```
\ \ \ \ PHYSICALDRIVE9
  \ \ \ \ Partition 1 [512MB]
  \ \ \ \ Partition 2 [1024MB]
  \ \ \ \ Partition 3 [16MB]
  \ \ \ \ Partition 4 [128MB]
  \ \ \ \ Partition 5 [1024MB]
  \ \ \ \ Partition 6 [1024MB]
  \ \ \ \ Partition 7 [1024MB]
  \ \ \ \ Partition 8 [1024MB]
  \ \ \ \ Partition 9 [8192MB]
  \ \ \ \ Partition 10 [1024MB]
  \ \ \ \ Partition 11 [8192MB]
  \ \ \ \ Partition 12 [6144MB]
  \ \ \ \ Partition 13 [334817MB]
  \ \ \ \ Partition 14 [1024MB]
  \ \ \ \ Partition 15 [16384MB]
  \ \ \ \ Unpartitioned Space [GPT]
```
Internet Browser
Browsing History

Google Play

Need for Speed™ Network - Android Apps on Google Play

Need for Speed™ Network

Golf - Google Search

http://www.golf.com/

Sign In: Sony Entertainment Network

Sign In: Sony Entertainment Network

My Profile | PSN - PlayStation®

http://us.playstation.com/psn/play-memories/
Error History

Error History - The Error History should be viewed first as errors may be introduced by the analyst during the investigation.
Trophies

- **Ghost Stories**
  - Escape. (Complete “Ghost Stories” on any difficulty.)
  - Common 58.6%
  - Date: 4/2/2014 15:16

- **Spatial Awareness**
  - Kill your first enemy in the Call of Duty® Ghosts campaign.
  - Common 59.9%
  - Date: 4/2/2014 15:08

- **Brave New World**
  - Rendez-vous in Fort Santa Monica. (Complete “Brave New World” on any difficulty.)
  - Common 52.6%
  - Date: 4/2/2014 15:39

- **Liberty Wall**
  - Take down both attack helicopters.
  - Rare 39.5%

- **No Man’s Land**
  - Make it to San Diego. (Complete “No Man’s Land” on any difficulty.)
  - Rare 47.5%
  - Date: 4/2/2014 16:35
Write Blocker - Tableau
Write Blocker - Shadow Drive
## Jpeg Extraction

![Image of EXIF IFDO table]

### EXIF IFDO

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image Description {0x010E}</td>
<td>20140821153227</td>
</tr>
<tr>
<td>Camera Make {0x010F}</td>
<td>Sony Computer Entertainment Inc.</td>
</tr>
<tr>
<td>Camera Model {0x0110}</td>
<td>PlayStation(R)4</td>
</tr>
<tr>
<td>Picture Orientation {0x0112}</td>
<td>normal (1)</td>
</tr>
<tr>
<td>X-Resolution {0x011A}</td>
<td>72/1 ==&gt; 72</td>
</tr>
<tr>
<td>Y-Resolution {0x011B}</td>
<td>72/1 ==&gt; 72</td>
</tr>
<tr>
<td>X/Y-Resolution Unit {0x0128}</td>
<td>inch (2)</td>
</tr>
<tr>
<td>Software / Firmware Version {0x0131}</td>
<td>1.75</td>
</tr>
<tr>
<td>Last Modified Date/Time {0x0132}</td>
<td>2014:08:21 15:32:26</td>
</tr>
<tr>
<td>Y/Cb/Cr Positioning (Subsampling) {0x0213}</td>
<td>centered / center of pixel array (1)</td>
</tr>
</tbody>
</table>
MP4 Extraction
## Offline Analysis

<table>
<thead>
<tr>
<th>Firmware version</th>
<th>1.62</th>
<th>1.72</th>
<th>1.75/1.76</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browser</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>ShareFactory</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Capture Gallery</td>
<td>X</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>System Storage Management</td>
<td>X</td>
<td>X</td>
<td>✓</td>
</tr>
<tr>
<td>Error History</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>What's New</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Trophies</td>
<td>✓</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Profile</td>
<td>✓</td>
<td>X</td>
<td>P</td>
</tr>
<tr>
<td>Friends</td>
<td>✓</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Party</td>
<td>✓</td>
<td>X</td>
<td>✓</td>
</tr>
<tr>
<td>Messages</td>
<td>✓</td>
<td>X</td>
<td>✓</td>
</tr>
<tr>
<td>Notifications</td>
<td>✓</td>
<td>P</td>
<td>P</td>
</tr>
<tr>
<td>System Settings</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

✓ = Fully Retrievable.
X = Not Retrievable.
P = Partially Retrievable.
# Online Analysis

<table>
<thead>
<tr>
<th>Firmware version</th>
<th>1.62</th>
<th>1.72</th>
<th>1.75/1.76</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browser</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>ShareFactory</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Capture Gallery</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>System Storage Management</td>
<td>✗</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Error History</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>What's New</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Trophies</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Profile</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Friends</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Party</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Messages</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Notifications</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>System Settings</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

✓ = Fully Retrievable.  
✗ = Not Retrievable.
Summary

• Best practice methodology developed.
• Evidential integrity maintained.
• Offline vs. online considerations.
• Future firmware updates will continue to challenge investigators.
Future Work

PlayStation Camera

- The PlayStation camera enables users to utilise enhanced security features such as facial recognition login. Can this be used to prove ownership, can we use a picture etc. of suspect to make system unlock?

PlayStation Vita & PS4

- The implications of the PlayStation Vita when linked to the PS4. The PS Vita enables users to remotely access and control their PlayStation 4. Evidence of usage and communication?

PlayStation Companion App - Phones & Tablets

- The PlayStation Companion App is compatible with both modern smart phones and tablets and can be used to gain remote access of the PlayStation 4.
Questions?

Presenter:
Matt Davies - Digital Forensic Analyst
Sytech Digital Forensics
Email: matt.davies@sytech-consultants.com
Company website: sytech-consultants.com
Tel: (01782) 286 300
Fax:(01782) 280 306

Dr. Huw Read - Senior Lecturer
University of South Wales
Email: huw.read@southwales.ac.uk
Tel:(01443) 654 287